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PROVISIONAL APPLICATION COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION under 37 CFR 1.53(c).

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TITLE OF THE INVENTION (*280 characters max*)

METATHESIS OF FISCHER-TROPSCH PROCESS PRODUCTS TO PRODUCE ALKYL BENZENES, DRILLING FLUIDS AND OXO-ALCOHOLS

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ENCLOSED APPLICATIONS PARTS (*check all that apply*)

X	Specification	No. of Pages	10			Small Entity Statement
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X	A check in the amount of $150 to cover the filing fee is enclosed.	Check No. 14490	PROVISIONAL FILING FEE	$150
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[X] Additional inventors are being named on separately numbered sheets attached hereto.

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

[X] No.

[ ] Yes, the name of the U.S. Government agency and the Government contract number are:

Respectfully submitted,

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PROVISIONAL APPLICATION FILING ONLY

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METATHESIS OF FISCHER-TROPSCH PROCESS PRODUCTS TO PRODUCE ALKYL BENZENES, DRILLING FLUIDS AND OXO-ALCOHOLS

The invention provides alkyl benzene (AB), drilling fluid and oxo-alcohols derived from metathesis of Fischer-Tropsch process products.

Conversion of lower olefins to higher olefins can be achieved by an isomerizing metathesis process, or metathetic oligomerisation. Conventional metathesis processes require an olefinic feedstock high in purity and linearity and produce highly linear products.

Various heterogeneous contact catalysts such as Re_2O_7/Al_2O_3 and $Re_2O_7/Al_2O_3.SiO_2$, and also combinations of these catalysts with co-catalysts can be used for metathesis of unfunctionalized olefins. However, other catalyst and co-catalyst combinations, for example for homogeneous metathesis using WCl_6 and/or $ReCl_6$ and a co-catalyst, have been used successfully and the invention is not limited to any specific catalyst system, nor to homogeneous or hetergeneous metathesis.

Surprisingly, and contrary to conventional thinking, it has now b en found that by using metathesis on Fischer-Tropsch process products i.e. using Fischer-Tropsch feedstock to the metathesis process, which feedstock includes both branched and unbranched olefins, as well as non-olefinic components, specific hydrocarbons having between 8 and 18 carbons can be obtained, which hydrocarbons may be used to derive AB, oxo-alcohols and drilling fluid.

By a Fischer-Tropsch process product or feedstock is meant a product obtained by subjecting a synthesis gas including carbon monoxide and hydrogen, to Fischer-Tropsch reaction conditions in the presence of typically an iron based catalyst, a cobalt based catalyst, and iron/cobalt based catalyst, or any other Fischer-Tropsch catalyst, under Fischer-Tropsch reaction conditions.

This invention provides products in the 8 to 18 carbon range derived from 5 to 10 carbon Fischer-Tropsch process products, the products in the 8 to 18 carbon range having a desirable degree of branching or non-linearity.

Thus, according to a first aspect of the invention, there is provided an oxo-alcohol composition including oxo-alcohols having between 8 and 18 carbon atoms, the oxo-alcohols being derived from olefins obtained by metathesis of one or more of 5, 6, 7, 8, 9 and/or 10 carbon containing Fischer-Tropsch derived feedstock.

Between 10% and 90% of the oxo-alcohols of the composition may be branched oxo-alcohols.

The oxo-alcohols of the composition may be predominantly linear, with between 10% and 49% branched oxo-alcohols in the composition.

The composition includes between 15% and 35% branched oxo-alcohols.

The composition includes 24% branched oxo-alcohols.

The branching on the branched oxo-alcohols is predominantly mono-methyl branching, however, some di-methyl branching may also be present.

Typically, the mono-methyl branching will be in excess of 90% of the branching, or even in excess of 95%.

Typically, the oxo-alcohols of the composition in the 8 to 10 carbon range are usable as plasticizer alcohols.

Typically, the oxo-alcohols of the composition in the 10 to 16 carbon range are usable as detergent alcohols.

A typical product make up from the metathesis of a 7 carbon Fisch r-Tropsch derived feedstock and suitable for deriving oxo-alcohols therefrom is set out in Table 1 at the end of the specification.

This product of Table 1 may typically be hydroformylated using a Co-EP catalyst, or any other suitable catalyst, to form predominantly linear alcohols, the ratio of linear to branched alcohols being related to the ratio of linear to branched product of the metathesis of the 7 carbon Fischer-Tropsch derived feedstock.

Thus, according to a second aspect of the invention, there is provided an alkyl benzene (AB) composition including AB having between 10 and 14 carbon atoms on the alkyl chain, the AB being derived from olefins obtained by metathesis of one or more of a 6,7 and/or 8 carbon containing Fischer-Tropsch derived feedstock.

The AB composition may contain between 10% and 90% of branched alkyl chain AB.

The AB composition may contain predominantly linear alkyl chain AB, with between 10% and 49% branched alkyl chain AB in the composition.

The composition includes between 15% and 35% branched alkyl chain AB.

The composition includes about 24% branched alkyl chain AB.

The branching on the branched alkyl chain of the AB is predominantly mono-methyl branching, however, some di-methyl, ethyl, and /or propyl branching may also be present.

Typically, the mono-methyl branching will be in excess of 90% of the branching, or even in excess of 95%.

A typical AB product make up produced from the products of metathesis of a 9 carbon Fischer-Tropsch derived feedstock is set out in Table 3 at the end of the specification.

The AB may be sulfonated to give an alkyl benzene sulfonate which may be used as a detergent. However, the AB composition itself may have uses such as for drilling fluids.

The product of Table 3 was fractionated and a 10 to 14 carbon alkyl chain AB fraction was obtained having the following composition (represented as the linear internal olefin only):

Dec nes	:	16.53%
Undecenes	:	27.96%
Dodecenes	:	26.19%
Tridecenes	:	4.71%
Tetradecenes:		0.91%

Methyl branched internal olefins in the 10 to 14 carbon range make up most of the remainder.

Thus, according to a third aspect of the invention, there is provided a drilling fluid composition including hydrocarbons having between 14 and 18 carbon atoms, the hydrocarbons being derived from olefins obtained by metathesis of one or more of a 8, 9 and/or 10 carbon containing Fischer-Tropsch derived feedstock.

The drilling fluid composition may include between 10% and 90% branched hydrocarbons.

The hydrocarbons of the drilling fluid composition may be predominantly linear, with between 10% and 49% branched hydrocarbons in the composition.

The composition includes between 15% and 35% branched hydrocarbons.

The composition includes about 24% branched hydrocarbons.

The branching on the branched hydrocarbons is predominantly mono-methyl branching, however, some di-methyl, ethyl, and/or propyl branching may also be present.

Typically, the mono-methyl branching will be in excess of 90% of the branching, or even in excess of 95%.

A typical product make up from the metathesis of a 9 carbon Fischer-Tropsch derived feedstock and suitable for deriving the drilling fluid composition is set out in Table 2 at the end of the specification.

The product of Table 2 was fractionated and a 14 to 17 carbon fraction was obtained having the following approximate composition (represented as both methyl branched and linear internal olefins):

Tetradecenes	:	23.03%
Pentadecenes	:	38.40%
Hexadecenes	:	36.22%
Heptadecene	:	2.35%

TABLE 1: Mass and component balance : Batch Metaf reaction of water washed SLO C7 cut

MASS CATALYST (g)	51.81
MASS C7 FEED (g)	316.38
MASS PRODUCT (g)	280.55
mol me-hexenes + n-heptenes in	2.90
mol me-hexenes + n-heptenes out	0.26
heptene conversion	91.06
mol C10-14 formed	0.94
mol % yield	65.18
selectivity (%)	71.58

COMPONENT	FEED mass %	FEED mass (g)	FEED moles	From GC PRODUCT mass %	normalized PRODUCT n.mass%	mass L PRODUCT mass	moles G+L PRODUCT moles	mass G+L PRODUCT mass	mass% PRODUCT mass%
3-Me-1-hexene	1.0690	3.3831	0.0345	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5-Me-1-hexene	2.3655	7.4840	0.0762	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4-Me-1-hexene	3.8129	12.0632	0.1229	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2-Me-1-hexene	6.0078	19.0076	0.1936	0.2768	0.2890	0.8109	0.0083	0.8109	0.2428
2-Methylhexane	1.6928	5.3557	0.0534	2.3491	2.4352	6.8320	0.0682	6.8320	2.0457
3-Methylhexane	3.0273	9.5777	0.0956	3.8165	3.9564	11.0995	0.1108	11.0995	3.3236
1-heptene	75.6871	239.4590	2.4387	1.1185	1.1594	3.2528	0.0331	3.2528	0.9740
n-heptane	2.5700	8.1311	0.0811	2.7406	2.8411	7.9706	0.0795	7.9706	2.3887
heptene (Z,E)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3-Heptene	0.9803	3.1016	0.0316	3.5837	3.7150	10.4226	0.1061	10.4226	3.1209
diene or cyclic olefin	1.0121	3.2020	0.0398	0.0909	0.0942	0.2643	0.0027	0.2643	0.0791
2-Heptene	0.0000	0.0000	0.0000	3.7687	3.9069	10.9607	0.1116	10.9607	3.2820
Dienes or cyclic olefins	0.5094	1.6115	0.0168	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ethylene							0.2385	6.6783	1.9997
Propylene				0.0392	0.0406		0.2708	11.3746	3.4060
Butenes				0.8708	0.9027		0.2196	12.2950	3.6818
Pentenes				1.2648	1.3111		0.1977	13.8366	4.1432
Hexenes				3.0294	3.1405		0.2900	24.3638	7.2954
methyl branched heptenes				1.5435	1.6001	4.4891	0.0400	4.4891	1.3442
n-octenes				11.1916	11.6018	32.5489	0.2900	32.5489	8.7463
n-Nonenes				8.5800	8.8944	24.9533	0.1977	24.9533	7.4719
methyl branched nonenes				1.6263	1.6859	4.7299	0.0337	4.7299	1.4163
n-Decenes				10.5892	10.9773	30.7969	0.2196	30.7969	9.2216
methyl branched decenes				3.1162	3.2305	9.0630	0.0587	9.0630	2.7138
n-undecenes				14.3685	14.8951	41.7883	0.2708	41.7883	12.5128
methyl branched undecenes				2.6638	2.7614	7.7472	0.0460	7.7472	2.3198
n-dodecenes				13.8046	14.3106	40.1483	0.2385	40.1483	12.0218
methyl branched dodecenes				0.4917	0.5097	1.4301	0.0078	1.4301	0.4282
tridecenes				3.3627	3.4860	9.7799	0.0536	9.7799	2.9284
tetradecene				0.8584	0.8899	2.4966	0.0127	2.4968	0.7476
pentadecene				0.1911	0.1981	0.5558	0.0026	0.5558	0.1664
unknowns	1.2655	4.0037							
heavies				1.1257	1.1670	3.2739		3.2739	0.9803
TOTAL	100.0000	316.3800	3.1833	96.4644	100.0000	285.4146	3.1935	333.9630	100.0000

TABLE 2: Mass and componenal balance

3) Batch Metol reaction of acetonitrile washed SLO C9 cut (A540 treated)

C9 : Re2O7	1000 : 1
MASS CATALYST (g)	0.75
MASS C9 FEED (g)	10.71
MASS PRODUCT (g)	8.99
mol me-octenes + n-nonenes in	0.07
mol me-octenes + n-nonenes out	0.01
nonene conversion	80.56
mol C14-16 formed	0.02
mol % yield	52.28
selectivity (%)	64.90

COMPONENT	FEED mass %	FEED mass (g)	FEED moles	From GC PRODUCT mass %	normalized PRODUCT n.mass%	mass L PRODUCT mass	moles G+L PRODUCT moles	mass G+L PRODUCT mass	mass% PRODUCT mass%
3-Me-1-octene	0.1407	0.0151	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7+4-Me-1-octene	0.9809	0.1050	0.0008	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6-me-1-octene	0.9637	0.1032	0.0008	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2-Me-1-octene	0.8992	0.0963	0.0008	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4+2-Methyloctane	1.1467	0.1228	0.0010	1.4915	1.5620	0.1560	0.0012	0.1560	1.4687
3-Methyloctane	1.5091	0.1616	0.0013	1.8563	1.9441	0.1941	0.0015	0.1941	1.8279
n-nonenes	75.5614	8.0890	0.0641	15.6354	16.3747	1.6350	0.0130	1.6350	15.3960
n-nonane	11.3149	1.2113	0.0121	13.5302	14.1700	1.4149	0.0110	1.4149	13.3231
dienes/cyclic olefins	1.7378	0.1860	0.0019	1.1309	1.1843	0.1183	0.0009	0.1183	1.1135
Ethylene					0.0000		0.0061	0.1706	1.6064
Propylene				0.7247	0.7590		0.0065	0.2741	2.5809
Butenes				1.0477	1.0972		0.0041	0.2272	2.1397
Pentenes				0.4604	0.4822		0.0021	0.1437	1.3528
Hexenes				0.2933	0.3071		0.0010	0.0833	0.7844
heptenes				1.4253	1.4927	0.1490	0.0015	0.1490	1.4035
n-octenes				4.5070	4.7202	0.4713	0.0042	0.4713	4.4380
n-Decenes				10.3012	10.7880	1.0772	0.0077	1.0772	10.1435
n-undecenes				1.8046	1.8899	0.1887	0.0012	0.1887	1.7770
n-dodecenes				1.5963	1.6718	0.1669	0.0010	0.1669	1.5719
tridecenes				3.5788	3.7480	0.3742	0.0021	0.3742	3.5240
methyl branched C13				0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
tetradecene				7.6190	7.9793	0.7967	0.0041	0.7967	7.5024
methyl branched C14				0.6949	0.7277	0.0727	0.0004	0.0727	0.6842
pentadecene				13.1270	13.7477	1.3727	0.0065	1.3727	12.9260
methyl branched C15				0.7346	0.7693	0.0768	0.0004	0.0768	0.7234
hexadecene				13.0782	13.6945	1.3674	0.0061	1.3674	12.8760
heptadecene				0.8497	0.8898	0.0888	0.0004	0.0888	0.8366
unknowns	5.7457	0.6151		4.5151		0.0000			
TOTAL	94.2543	10.7052	0.0809	95.4849	100.0000	9.7208	0.0650	10.6197	100.0000

TABLE 3: P ak Assignments and Mass %

Assignment	Mass%
Branched C_{10} benzene	0.61
Branched C_{10} benzene	0.12
Branched C_{10} benzene	0.14
Branched C_{10} benzene	0.20
Branched C_{10} benzene	0.29
Branched C_{10} benzene	0.39
5-Decylbenzene	2.91
4-Decylbenzene	2.79
Branched C_{10} benzene	0.17
Branched C_{10} benzene	0.76
3-Decylbenzene	4.34
Branched C_{10} benzene	0.25
Branched C_{10} benzene	0.62
Branched C_{11} benzene	1.23
2-Decylbenzene	6.67
Branched C_{11} benzene	0.70
Branched C_{11} benzene	0.57
Branched C_{11} benzene	0.88
5+6-Undecylbenzene	7.95
Branched C_{11} benzene	0.52
4-Undecylbenzene	4.59
Branched C_{11} benzene	1.76
3-Undecylbenzene	8.49
Branched C_{11} benzene	1.10
Branched C_{12} benzene	0.41
Branched C_{12} benzene	0.93
2-Undecylbenzene	10.22
Branched C_{12} benzene	0.59
Branched C_{12} benzene	0.94
6-Dodecylbenzene	4.57
5-Dodecylbenzene	3.83
Branched C_{12} benzene	0.71
4-Dodecylbenzene	3.85
Branched C_{12} benzene	0.49
Branched C_{12} benzene	0.54
Branched C_{12} benzene	0.82
3-Dodecylbenzene	5.98
Branched C_{12} benzene	0.66
Branched C_{13} benzene	0.74
2-Dodecylbenzene	7.92
5+6-Tridecylbenzene	1.04
4-Tridecylbenzene	0.73
3-Tridecylbenzene	1.42
2-Tridecylbenzene	1.38
Branched C_{14} Benzenes	0.48
Branched C_{14} Benzenes	1.45
5+6-Tetradecylbenzene	0.50
4-Tetradecylbenzene	0.21
3-Tetradecylbenzene	0.51
2-Tetradecylbenzene	0.77
Total	100.00

Summary

C_{10}	
2-Decylbenzene	6.67
3-Decylbenzene	4.34
4-Decylbenzene	2.79
5-Decylbenzene	2.91
Total linear	16.90
Total branched	3.65
Total	20.56
C_{11}	
2-Undecylbenzene	10.22
3-Undecylbenzene	8.49
4-Undecylbenzene	4.59
5+6-Undecylbenzene	7.95
Total linear	31.26
Total branched	6.78
Total	38.04
C_{12}	
2-Dodecylbenzene	7.92
3-Dodecylbenzene	5.98
4-Dodecylbenzene	3.85
5-Dodecylbenzene	3.83
6-Dodecylbenzene	4.57
Total linear	26.13
Total branched	6.08
Total	32.21
C_{13}	
2-Tridecylbenzene	1.38
3-Tridecylbenzene	1.42
4-Tridecylbenzene	0.73
5+6-Tridecylbenzene	1.04
Total linear	4.56
Total branched	0.74
Total	5.30
C_{14}	
2-Tetradecylbenzene	0.77
3-Tetradecylbenzene	0.51
4-Tetradecylbenzene	0.21
5+6-Tetradecylbenze	0.50
Total linear	1.99
Total branched	1.91
Total	3.90
Total LAB	100.00